

CSM – 34 / 15

Geology

Paper – I

Time : 3 hours

Full Marks : 300

The figures in the right-hand margin indicate marks.

*Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and **three** of the remaining questions, selecting at least **one** from each Section.*

Section – A

1. Answer any **three** of the following in about **200** words each : **20×3 = 60**
- (a) Describe the Earth's internal structure based on chemical composition and mechanical (physical) properties and justify your answer with two different sketches.

- (b) List five ways in which the effects of weathering are expressed in natural outcrops of bedrock.
- (c) Describe the data types and their sources used for GIS in India and explain data processing in GIS application with desired steps and suitable examples.
- (d) Compare the kinds of deformation produced by extension and those produced by contraction and contrast brittle and ductile behaviour in rocks.
2. (a) Compare the relative earthquake hazard along a divergent, transform, and convergent plate boundary. How does the depth of earthquakes indicate (i) convergent plate margins and (ii) divergent plate margins? Describe the difficulties that geologists have encountered in trying to predict earthquakes.
- $12+12+6 = 30$
- (b) Explain the structural features that are associated with the following tectonic settings :
- $10+10+10 = 30$
- (i) Compression

- (ii) Extension
- (iii) Strike-slip fault

3. (a) Describe and illustrate the three major subsystems of a river. Draw a diagram showing the general nature of transportation of (i) bed load, (ii) suspended load and (iii) dissolved load. 15+15 = 30
- (b) Describe the electromagnetic spectrum. Explain the electromagnetic process in integration with GIS. Explain the electromagnetic energy interactions with earth surface materials. 10+0+10 = 30
4. (a) Make a perspective sketch of an anticline and syncline pair, and label the given features : (i) hinge plane, (ii) hinge, (iii) angle of plunge and (iv) limbs. Define the given with neat sketches : (v) Reclined fold, (vi) Parasitic fold, (vii) overturned fold and (viii) Sheath fold. Compare between ductile deformation and brittle deformation (discuss processes and products of each). 10+10+10 = 30

- (b) Describe the three deformation mechanisms that operate in the plastic deformation of quartz. Using stress-strain diagrams, show the difference in deformation response between elastic and linear viscous materials. With drawings, differentiate between the stress ellipse and the strain ellipse. How are the two interrelated ?

10+10+10 = 30

Section – B

5. Answer any **three** of the following each in about **200** words : $20 \times 3 = 60$
- (a) Types of microfossils and stratigraphic significance.
 - (b) Any three physical criteria of stratigraphic correlation.
 - (c) Rain water harvesting.
 - (d) Application of microfossils for palaeoclimatic inferences
6. Discuss the details of the following : $30 \times 2 = 60$
- (a) Evolution of man giving Indian examples of human fossil occurrences.

(b) Graptolites, their geologic distribution and environmental significance.

7. Describe the following in brief : $30 \times 2 = 60$

(a) Stratigraphic succession, distribution and economic significance of Proterozoic rocks of Peninsular India.

(b) Tertiary stratigraphic successions of Extra-Peninsular India.

8. Write explanatory notes on the following :

$30 \times 2 = 60$

(a) Porosity, permeability and their relation with water bearing characteristics of rocks

(b) Causes and prevention of landslide problems

